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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/565,104	01/19/2006	Hiroki Maeda	2006_0043A	5520
513 7590 07/16/2007 WENDEROTH, LIND & PONACK, L.L.P. 2033 K STREET N. W. SUITE 800 WASHINGTON, DC 20006-1021			EXAMINER EOFF, ANCA	
			ART UNIT 1753	PAPER NUMBER
			MAIL DATE 07/16/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/565,104

Applicant(s)

MAEDA ET AL.

Examiner

Anca Eoff

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 01/19/2009, 03/06/2007, 06/15/2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 9-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 9-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date See Continuation Sheet.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :01/19/2006, 03/06/2007, 06/15/2007.

## DETAILED ACTION

### *Claim Status*

1. Claims 1-8 are canceled. Claims 9-17 are pending in the application.

### *Claim Rejections - 35 USC § 102*

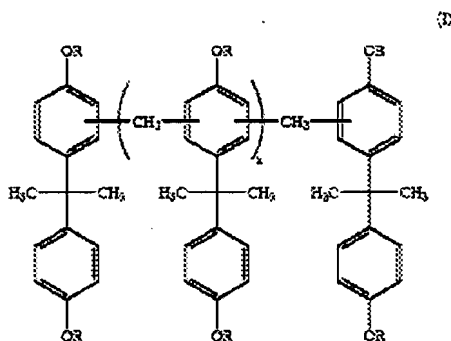
2. The following is a quotation of the appropriate paragraph of 35 U.S.C. 102 that forms the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 9-10 and 13-16 are rejected under 35 U.S.C. 102(e) as being anticipated by Weber et al. (US Pg-Pub 2005/0260522).

With regard to claims 9 and 10, Weber et al. disclose a photoresist composition comprising one or more bisphenol A-novolac epoxy resins according to formula (I):



(compound of formula (I) in par.0020), where R is individually selected from glycidyl or hydrogen and k is an integer from 0 to 30 (par.0021).

The compound of formula (I) where all the substituents R are glycidyl groups is equivalent to the compound represented in formula (3) of the instant application where  $R_1$  to  $R_6$  are all  $-CH_3$  groups.

One of the preferred compounds of formula (I) is Epicoat<sup>R</sup> 157 made by Japan Epoxy Resin Co., Ltd. (par.0034 and table 1 in par.0082), which is mentioned in the instant application as multifunctional bisphenol A novolak epoxy resin (A-1) in par.0057.

Weber et al. further disclose that the photoresist composition further comprises one or more cationic photoinitiators (par.0024), such as aromatic sulfonium complex salts (par.0037). One of the preferred cationic photoinitiators is SP-172 produced by Asahi Denka (table 1 in par.0082), which is mentioned in the instant application as the cationic polymerization (B-1), 4-(4-(2-chlorobenzoyl)phenylthio)phenylbis(4-fluorophenyl)sulfonium hexafluoroantimonate (par.0057 and par.0037).

The photoinitiator SP-172 (4-(4-(2-chlorobenzoyl)phenylthio)phenylbis(4-fluorophenyl)sulfonium hexafluoroantimonate) meets the limitations for the cationic polymerization initiator of formula (1) in claim 9 of the instant application (where  $X_1$  and  $X_2$  are halogen atoms, specifically fluorine atoms and Y is a halogen atom, specifically a chlorine atom).

The photoinitiator SP-172 (4-(4-(2-chlorobenzoyl)phenylthio)phenylbis(4-fluorophenyl)sulfonium hexafluoroantimonate) is identical to the cationic polymerization initiator of formula (2) so it meets the limitation of claim 10 of the instant application.

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Weber et al. specifically discloses photoresist compositions comprising Epicoat<sup>R</sup> 157 bisphenol novolak A-epoxy resin and SP-172 cationic photoinitiator (Examples 28 and 29 in table 2 in par.0083).

With regard to claim 13, Weber et al. further disclose that the photosensitive composition comprises a solvent such as  $\gamma$ -butyrolactone (par.0038).

With regard to claim 14, Weber et al. further disclose a dry film photoresist comprising :

- a photoresist composition comprising the bisphenol A-novolac epoxy resins according to formula (I) and the cationic photoinitiator applied to a base film material;
- a cover film applied to the photoresist side of the coated film to protect the film from damage and the prevent sheets of coated material from sticking together (par.0065).

The dry film photoresist of Weber et al. is equivalent to the photosensitive resin composition laminate and the cover film of Weber et al. is equivalent to the protective film of the instant application.

With regard to claim 15, Weber et al. disclose a method of forming a pattern comprising the following steps:

- applying the photoresist solution to a substrate by spin-coating and performing a drying bake to evaporate the solvent (par.0059);
- photoimaging the solid photoresist coating using an exposure tool (par.0059);
- immersing in an organic solvent developer in order to dissolve away the non-polymerized regions (par.0059);

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- performing a post-bake to more fully harden the material by drying the polymerization to a higher degree of conversion (par.0063).

With regard to claim 16, Weber et al. further disclose a method comprising the following steps:

- peeling or otherwise removing the protective cover sheet from the photoresist layer;

- placing the dry film/ photosensitive resin composition laminate on a substrate/desired base with the photoresist side in contact with the substrate and laminate the photoresist to the substrate;

- imagewise-exposing the photoresist layer by irradiation;

- developing to create an image in the photoresist;

- curing by heating (par.0066-par.0068).

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

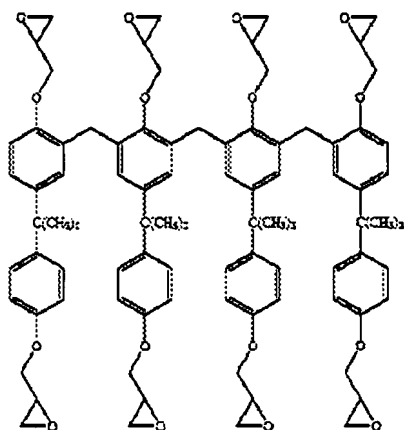
(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 9, 13, 15 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hurditch et al. (US Patent 6,391,523) in view of Okawa et al. (JP 9-268205).

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With regard to claim 9, Hurditch et al. disclose a composition for negative resist comprising:

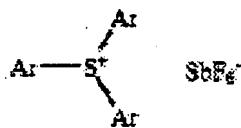
a) at least one particular polyfunctional epoxy resin which is capable of undergoing ring-opening polymerization under the influence of a strong acid catalyst (column 4, lines 1-3), such as a glycidyl ether of the novolac condensation product of bisphenol A and formaldehyde of formula (II):



(II), (column 4)

The compound of formula (II) is equivalent to the multi-functional bisphenol A novolak epoxy resin of formula (3) in the instant application, when  $R_1$  to  $R_6$  are  $-\text{CH}_3$  groups and  $n=2$ .

b) at least one photoacid which releases strong acid under the influence of ultraviolet light (column 4, lines 4-5), such as a triarylsulfonium salt of formula (III)



(III), where Ar represents a mixture of aryl groups (column 4, lines 50-64).

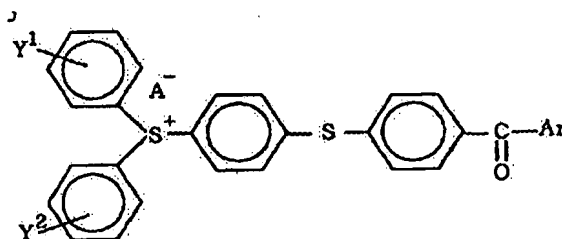


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However, Hurditch et al. do not disclose a substituted triarylsulfonium salt, such as the sulfonium salt of formula (1) of the instant application.

Okawa et al. disclose a resin for optical molding comprising a specific aromatic series sulfonium salt compound as photo-initiator for cationic polymerization (par.0009) and epoxy compounds such as a polyglycidyl ether of bisphenol A as cationic-polymerizable compounds (par.0019 – par.0021).

Okawa et al. disclose that the cationic initiator is represented by the formula (IV):6



(IV), (par.0010).

In formula (IV),  $Y^1$  and  $Y^2$  could be a hydrogen atom, a halogen, a hydrocarbon group which may contain an oxygen atom, a halogen or an alkoxy group to which a substituent may attach (par.0010), Ar is preferably an unsubstituted phenyl group or one or more hydrogen atoms of the phenyl group are substituted with alkoxy groups, halogen groups (fluorine, chlorine, bromine, iodine), an alkyl groups or a hydroxyalkyl group (par.0028) and the anion  $A^-$  could be  $SbF_6^-$  (par.0014)

One of the sulfonium salt represented by formula (IV) is 4-(4-benzoyl phenylthio) phenyl diphenyl sulfonium hexafluoroantimonate (par.0035), which is equivalent to the

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cation polymerization of the formula (1) in the instant application when  $X_1$ ,  $X_2$  and Y are all hydrogen atoms.

The composition of Okawa et al. presents the advantage of making unnecessary the post-cure processing, produce little contraction at hardening/curing and produces easily the molding object of desired dimension (par.0001).

Therefore, it would have been obvious for one of ordinary skill in the art at the time of the invention to use the cationic initiator of formula (IV) disclosed by Okawa et al. in the composition of Hurditch et al. in order to obtain a curable composition that makes unnecessary the post-cure processing and produces little contraction during curing (Okawa et al., par.0001).

With regard to claim 13, Hurditch et al. disclose that  $\gamma$ -butyrolactone is selected as solvent for the resins of formula (II), commercially sold as SU-8 epoxy resin because of its high solvency of the SU-8 resin and because it is non-flammable (column 2, lines 39-41). Hurditch et al. specifically disclose a composition comprising  $\gamma$ -butyrolactone as solvent (column 9, lines 9-10).

With regard to claim 15, Hurditch et al. disclose a method of forming a pattern having the following steps:

- dissolving the polyfunctional epoxy bis-phenol A novolak resin, the photoacid generator and the other additives in the selected solvent (column 5, lines 19-21) and spin-coating the solution onto a substrate to form a uniform film (column 5, lines 31-32);
- performing a baking step to evaporate the solvent (column 5, lines 47-48);

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- photoimaging the solid photoresist coating using an exposure tool (column 5, lines 50-51);
- developing the coating in an organic solvent developer in order to dissolve away the unpolymerized regions (column 5, lines 60-62);
- performing a post-bake step of the resulting image to fully harden the material (column 5, lines 66-67).

With regard to claim 17, Hurditch et al. further disclose that the content of resin of formula (II) is about 90 mass % based on the total solid content of the photosensitive composition (comparative example 2, column 8).

6. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hurditch et al. (US Patent 6,391,523) in view of Okawa et al. (JP 9-268205) as applied to claim 9 above and in further view of Umeyama et al. (JP 11-323094).

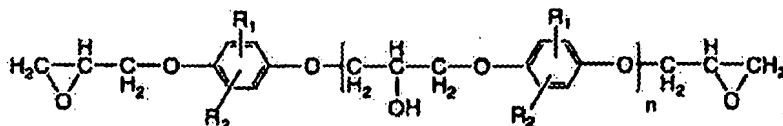
With regard to claims 9 and 11, Hurditch modified by Okawa teach a photosensitive composition comprising the polyfunctional epoxy resin of formula (II) and the cation polymerization initiator of formula (V) as applied to claim 9 above (see paragraph 5 of the Office Action) but fail to disclose that the composition further comprises a linear polymeric 2-functional epoxy resin.

Umeyama et al. teach an epoxy resin system with good storage stability and capability of forming a smooth film, which also overcomes the problems of low melt viscosity and the difficulties in handling bisphenol A epoxy resins at low temperatures for a long duration (par.007).

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Umeyama et al. disclose a cationic polymerizable epoxy resin system comprising:

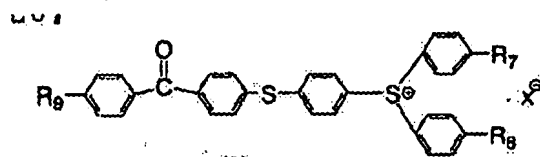
- a linear polymer of formula (VI)



(VI) (par.0010),

where  $R_1$  and  $R_2$  are hydrogen atoms,  $C_1$ - $C_6$  alkyl groups or a halogen atom (par.0011);

- the cationic photoinitiator of formula (VII)



(VII)(par.0014),

where  $R_7$ ,  $R_8$  are hydrogen atoms, an alkyl group, a halogen atom, a hydroxyl alkyloxy radical or an alkoxy group,  $R_9$  is an alkyl group and  $X^-$  can be  $SbF_6^-$  (par.0015).

The linear polymer of formula (VI) can be used in combination with other epoxy resins, such as bisphenol A or glycidyl ethers of various novolak resin (par.0018).

The epoxy resin system has excellent storage stability, produces a smooth film and has excellent reactivity without an odor (par.0008).

Therefore, it would have been obvious for one of ordinary skill in the art at the time of the invention to incorporate the linear polymers of Umeyama et al. in the composition of modified Hurditch, in order to obtain a photosensitive composition with good storage stability and capability of forming a smooth film, which also overcomes the

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problems of low melt viscosity and the difficulties in handling bisphenol A epoxy resins at low temperatures for a long duration (Umeyama et al, par.0007-0008).

7. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Weber et al. (US Pg-Pub 2005/0260522) in view of Kamabuchi et al. (US Pg-Pub 2003/0148211).

With regard to claims 9 and 12, Weber et al. disclose a photoresist composition comprising one or more bisphenol A-novolac epoxy resins according to formula (I) and a cationic photoinitiator such as 4-(4-(2-chlorobenzoyl) phenylthio)phenylbis(4-fluorophenyl)sulfonium hexafluoroantimonate, as applied to claim 9 above (paragraph 3 of the Office Action). Weber et al. also disclose that sensitizers such as naphthalene derivatives could be added to the composition or could be incorporated in the photoacid generators/cationic photoinitiators (par.0009) but do not specifically disclose a naphthol as a naphthalene derivative used as sensitizer.

Kamabuchi et al. disclose a chemically amplified resist composition comprising a triarylamonium salt as photoacid generator and a sensitizer (abstract). Specific examples of sensitizers are naphthalene derivatives having at least one hydroxyl groups or alkoxy group, such as 1-naphthol (par.0088). The sensitizers are used to promote the photoreaction of the sulfonium salt (par.0086).

Therefore, it would have been obvious for one of ordinary skill in the art at the time of the invention to include the 1-naphthol sensitizer disclosed by Kamabuchi et al. in the composition of Weber et al., based on Weber's teaching that naphthalene

derivatives could be added to the composition (Weber et al., par.0009) and in order to promote the photoreaction of the sulfonium salt used as cationic photoinitiator (Kamabuchi et al, par.0086).

### ***Conclusion***

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anca Eoff whose telephone number is 571-272-9810. The examiner can normally be reached on Monday-Friday, 6:30 AM-4:00 PM, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AE *AE*

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